

*Proposed*

ARGUMENTS PRESENTED AT PERSONAL INTERVIEW WITH EXAMINER KATARZYNA W. LEE ON DECEMBER , 2002

Atty. Docket No. 6-1034-040

Applicants: Vasilios KANELLOPOULOS, Isabelle LOUIS-JOSEH-DOGUE, Vincent Daniel McGINNIS, Durvodham MANGARAJ, and Tomoki Tsuchiya NAKAMURA

Serial No.: 09/601,912 Group Art Unit: 1714

Filed: August 9, 2000 Examiner: Katarzyna W. Lee

For: A POLYMERIC COMPOSITION FOR FRICTION ELEMENTS

RESPONSE TO FINAL REJECTION MAILED OCTOBER 29, 2002

BOX FEE AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

This is in response to the Office Action mailed October 29, 2002; and to a personal interview kindly granted by Examiner Katarzyna W. Lee with attorneys for applicants' William Wright and Stephen Emery on December , 2002.

IIMURO ET AL. FAILS TO ANTICIPATE THE SUBJECT MATTER OF CLAIMS 1, 5 TO 7 AND 12 TO 14 UNDER 35 U.S.C 102(b)

It is earnestly solicited that the rejected claims are clearly not anticipated by Iimuro et al. (U.S. patent 5,132,349). Iimuro et al. teaches (col. 1, lines 11 to 28) a phenol-based resin composition having enhanced properties, accomplished by dispersing a sufficiently crosslinked silicone rubber in a phenol-based resin in the form of fine particles; and prepared by the

"steps of mixing a heat-melted phenol-based resin with an emulsifier, organopolysiloxane having silanol groups on both ends of molecular chain, a cross-linking agent for silanol condensation and a catalyst for the silanol crosslinking; conducting a condensation reaction of said organopolysiloxane in said phenol-based resin with continuous or intermittent charge of water to the resultant mixture; and removing unnecessary water after finishing the reaction."

Iimuro et al. teaches (col. 2, lines 32 to 38) the resultant silicone rubber is dispersed in the phenol-based resin in the form of fine particles, the size of particles being governed at least in part by the relative amount of the emulsifier present (col. 4, lines 10 to 17). Iimuro et al. addresses the problem in the prior art that the crosslinking reaction of the organopolysilanol progresses (in the absence of the phenol-based resin carrier) continuously during the course of addition of the three components, i.e., organopolysiloxane,

crosslinking agent for silanol condensation, and catalyst for silanol condensation (col. 6, lines 31 to 36). Iimuro et al. emphasizes (col. 6, lines 38 to 45, emphasis added):

After all components which form silicone rubber are added to the phenol-based resin, crosslinking reaction of the silicone rubber is carried out in the phenol-based resin while continuously or intermittently adding water to the resultant mixture.

The Examiner urges (page 4 of Office Action mailed April 10, 2002; note also page 3, line 21, of Amendment filed August 9, 2002) that in Iimuro et al. "a condensation will occur inherently causing phenolic groups and silanol groups of the two resins to bind." The Examiner states (bottom of page 3 of Office Action mailed October 29, 2002, emphasis added), "Iimuro indicates the reaction of silanol groups and phenol-based resin." However, it is not clear from Iimuro et al. that the silanol groups react with the phenol-based resin. Iimuro et al. states the reaction of the silanol containing compounds takes place in the phenol-based resin. As acknowledged by the Examiner, Iimuro et al., is silent as to any reaction of the hydroxyl groups of the phenol-based resin with the terminal silanol groups of the organopolysiloxane resin. Moreover, the Examiner acknowledges applicants' invention differs from

"Iimuro in recitation of different temperature ranges as well as different phenolic monomers, which can be utilized in making binders modified with organopolysiloxane."

Importantly, Iimuro et al. does not mention or address the problem of water absorption in a friction element made from the polymeric composition due to unreacted hydroxyl groups. Moreover, applicants' Tables 2 and 6 (page 6, lines 9 to 17; page 9, lines 1 to 6; respectively) show that the time needed for water to disappear from the surfaces of specimens prepared using applicants' compositions corresponded to almost that for evaporation, indicating the water absorption for applicants' resin formulations is very low. Iimuro et al. repeatedly teaches (note col. 2, lines 32 to 38, for example) the crosslinking reaction of the silicone compound takes place in the phenol-based resin, and that the resultant silicone rubber is formed dispersed in the phenol based resin in the form of fine particles. There is no indication in Iimuro et al. that the silanol groups of the silicone compounds crosslink with the hydroxy groups of the phenol based resin. Iimuro et al. teach (col. 5, lines 25 to 30) use of organotin compounds as catalyst for the silanol condensation. Iimuro et al. teaches the phenol-based resin, such as a Novolak resin, is obtained by reacting one or more compounds having a phenolic hydroxyl group with aldehydes such as formaldehyde, etc. (col. 2, lines 40 to 60).

CLAIMS 2 TO 4, 8 TO 11 AND 15 TO 20 ARE PATENTABLE  
UNDER 35 U.S.C. 103 OVER IIMURO ET AL. TAKEN WITH KANE ET AL

The Examiner urges (page 6 of Office Action mailed April 10, 2002),

"Kane discloses another binder utilized in disk pads as part of friction material. In col. 9 and 10 of prior art Kane, phenolic resin is reacted with formaldehyde to form phenolic resin, wherein the resulting resin in col. 10 contains at least of non aromatic alcoholic group  $\text{HOCH}_2-$  required by the claims of the present invention."

Kane et al. teaches (col. 9) phenolic Novolac resins are thermoplastic materials and are made by heating phenol with a deficiency of formaldehyde in the presence of an acid catalyst. Kane et al. teaches that a phenol having a methylol group ( $-\text{CH}_2\text{OH}$ ) as an intermediate produced in the initial reaction, but which in subsequent heating and water addition steps reacts to form a Novolac resin mostly devoid of methylol groups (see reaction diagram in col. 9). Kane et al. teaches (col. 4, lines 40 to 58), the amount of aldehyde ingredient, such as hexamethylenetetramine, that is combined with the phenol determines the type of phenolic resin formed, i.e., phenolic resole or phenolic Novolak. Kane et al. teaches (col. 9, lines 57 to 63) the phenolic Novolacs do not condense further by themselves unless additional aldehyde, i.e., formaldehyde donors such as hexamethylenetetramine (hexamine), is added. Kane et al. teaches (col. 10, lines 59 et seq.) phenolic resoles will self condense with heat to form a cross-linked phenolic polymer without the addition of any other curing agent, although an acid catalyst may be used to reduce the curing time.

While Kane et al. teach (col. 3, lines 50 et seq.) their phenolic compositions are prepared using a sufficient amount of silicone intermediate to form phenolic siloxane compositions, those phenolic siloxane compositions are disclosed by Kane et al. (paragraph bridging columns 3 and 4) to comprise an interpenetrating polymer network (IPN). Kane et al. indicate (col. 4, lines 1 to 6, emphasis added) their IPN's

"are composed of chemically dissimilar crosslinking polymer chains; namely, siloxane polymer chains and phenolic polymer chains, which have little or no chemical bonding therebetween. The siloxane and phenolic polymer chains are held together by permanent chain entanglements."

Kane et al. additionally teach (paragraph bridging columns 15 and 16; and col. 16, lines 45 to 61),

"The silanol-functional silicone intermediates both polymerize to form a siloxane polymer and copolymerize with the phenolic polymer to form a phenolic siloxane composition. Hydrolysis of the alkoxy-functional silicone intermediates can optionally be accelerated by catalytic action of the organometallic compound and the amine compound. Accordingly, the resulting composition comprises a IPN of phenolic polymer and siloxane

polymer, wherein the phenolic polymer has siloxane groups in the backbone of the polymer.

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It is theorized that during the formation of the phenolic resin, and subsequent polymerization of the resulting phenolic resin, silanol groups of the silicone intermediate both react with silanol groups of the other silicone intermediates, forming a siloxane polymer, and react with phenolic hydroxyls and methyol hydroxyls of the phenolic resin, forming a phenolic polymer having siloxane groups in the polymer.

It would thus appear from Kane et al. that the silanol groups of the siloxane component react to form siloxane polymer chains and the hydroxyl groups of the phenolic resin react to form phenolic polymer chains, with the theoretical possibility that some of the silanol groups react with phenolic hydroxyls and methyol hydroxyls. However, the extent of such cross reaction is not taught by Kane et al. Moreover, Kane et al. It is respectfully urged that Kane et al. does not teach, and would not have rendered obvious, a polymeric composition and method of making same wherein the bonding between the phenolic groups and the terminal silanol groups is substantially complete.

#### REJECTION OF CLAIM 3 UNDER 35 U.S.C. 112

The Examiner urges that "n" as it appears in claim 3 must be defined. Applicants' specification states that the resin containing phenolic groups in claim 3 is, for instance, a commercial product sold under the name of Xylox by Mitsui Toatsu Chemicals. The range of "n" would thus be reasonably determinable by those in the art and reasonably definite within the meaning of 35 U.S.C. 112.

The term "hexamine" is used in claim 6. To complete the record, "Hexamine" is included as a synonym for "hexamethylene-tetramine" (page C-327, Handbook of Chemistry and Physics, 54th Edition, 1973-1974). Thus, hexamine, especially given the reproduction of the formula in the claim, would appear clear and definite, and to reasonably comply 35 U.S.C. 112.

#### CONCLUSION

Applicants respectively submit that the claims amended as proposed would meet the requirements of patentability, as discussed in the personal interview with Examiner Katarzyna W. Lee on December 2002. Issuance of a Notice of Allowance of claims 14 to 31 is earnestly solicited.

Respectfully submitted,

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